इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 13065 (1991): Bulk handling equipment - Wagon marshalling equipment - Endless rope type - General requirements [MED 7: Material Handling Systems and Equipment]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

भारतीय मानक

राशि प्रहस्तन उपस्कर — रेल डिब्बा (वैगन) विन्यास उपस्कर — सिरा विहीन रस्सानुमा टाइप — सामान्य अपेक्षाएँ

Indian Standard

BULK HANDLING EQUIPMENT — WAGON MARSHALLING EQUIPMENT — ENDLESS ROPE TYPE — GENERAL REQUIREMENTS

UDC 621·86 : 629·421·4

© BIS 1991

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

May 1991

Price Group 4

Bulk Handling Equipment Sectional Committee, HMD 07

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Bulk Handling Equipment Sectional Committee had been approved by the Heavy Mechanical Engineering Division Council.

Wagon marshalling equipment is required during loading/inloading operation for efficient hauling of railway wagons.

The requirements given in this standard are not-withstanding the requirements specified by any Statutory Act, Rules, Regulations or specific orders otherwise on the subject such as by Research, Design and Standards Organization (RDSO) of Ministry of Railways, Government of India.

The data/information to be supplied by the purchaser and the manufacturer to help selection and use of endless/open rope type wagon marshalling equipment is given in IS 13113 : 1991 Bulk handling equipment — Wagon Marshalling equipment — Endless rope type — Data sheet.

Indian Standard

BULK HANDLING EQUIPMENT — WAGON MARSHALLING EQUIPMENT — ENDLESS ROPE TYPE — GENERAL REQUIREMENTS

1 SCOPE

1.1 This Indian Standard covers general requirements of endless/open rope type wagon marshalling equipment.

2 REFERENCE

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 MATERIALS

3.1 The materials used in the construction of endless rope type wagon marshalling equipment shall comply with the requirements specified in the appropriate Indian Standards listed in Annex A.

4 SYSTEM REQUIREMENTS

4.1 The wagon marshalling equipment is provided for efficient hauling of railway wagons on track(s) during loading/unloading operation. The unit may haul a rake of wagons through loading point on one tracks only, or a rake of wagons through loading point one track and an equal rake of empty wagons in the opposite direction on the other track (*see* Fig. 1).

4.2 The endless rope loop is laid along the track at suitable distance in case of side hitching arrangement or along the centre of track in case of central hitching arrangement by dummy wagons or central hitch rope as the case may be, reeved through sheaves and driven by friction type haulage winch. To provide sufficient snubbing tension for traction, counter weighted gravity take-up shall be provided. The rope shall be supported by horizontal track rollers spaced at suitable intervals. Vertical guide rollers shall be used for curved track. The wagon shall be attached to the endless rope by hitch rope or dummy wagons.

4.3 In case of side hitching arrangement, maximum number of wagons to be pulled and the angle which the hitch rope makes with horizontal and vertical plane shall be so decided that wagon over-turning forces are well within the limits. When the hitch rope is clamped to the side of wagons the strength of side traction hook shall also be considered in determining the maximum number of wagons to be pulled at a time.

4.4 The hitch rope shall have suitable clamping arrangements for attaching to the endless rope and wagons of dummy wagons. It shall also have suitable tensioning device.

4.5 Depending on requirements of the purchaser, the system may be fully automatic controlled by photoelectric relays or limit switches. It may be manually operated with facilities for remote control as well as local control.

4.6 The system shall have facility for inching.

4.7 Over travel limit switches shall be used to prevent damage to terminal heaves in case operator fails to stop haulage rope.

4.8 As required by the purchaser the system may have:

a) Single speed drive

b) Variable speed drive

c) Dual speed drive capable of running hitch rope and/or rake of empty wagons at a speed higher than that for loaded wagons.

4.9 One of the following methods may be used for increasing the angle of contact between rope and drum (*see* Fig. 2):

a) Using two drums with parallel multiple-grooves. In this case the rope passes over the drums several times.

b) Using single drum with spiral grooves for accommodating several coils of rope, usually 3 to 5.

c) Using single drum with spiral grooves for accommodating several turns of rope (depending upon requirement) and both ends of rope fixed on drums.

5 GENERAL REQUIREMENTS

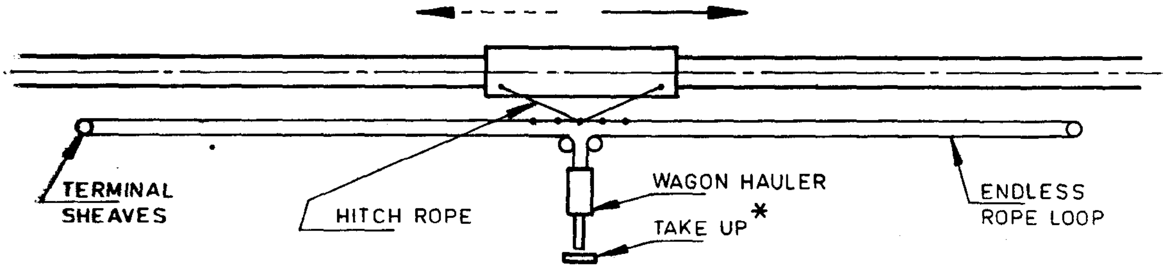
5.1 Base Frame

Base frame shall be made of hot rolled steel sections conforming to IS 808 (in various parts, *See* Annex A), machined on ends and well gusseted at corners and securely bolted. It shall be built up in sections bolted together so as to facilitate handling. It shall be suitably designed to with-stand static and dynamic loads of complete equipment mounted on it.

5.2 Rope Drums

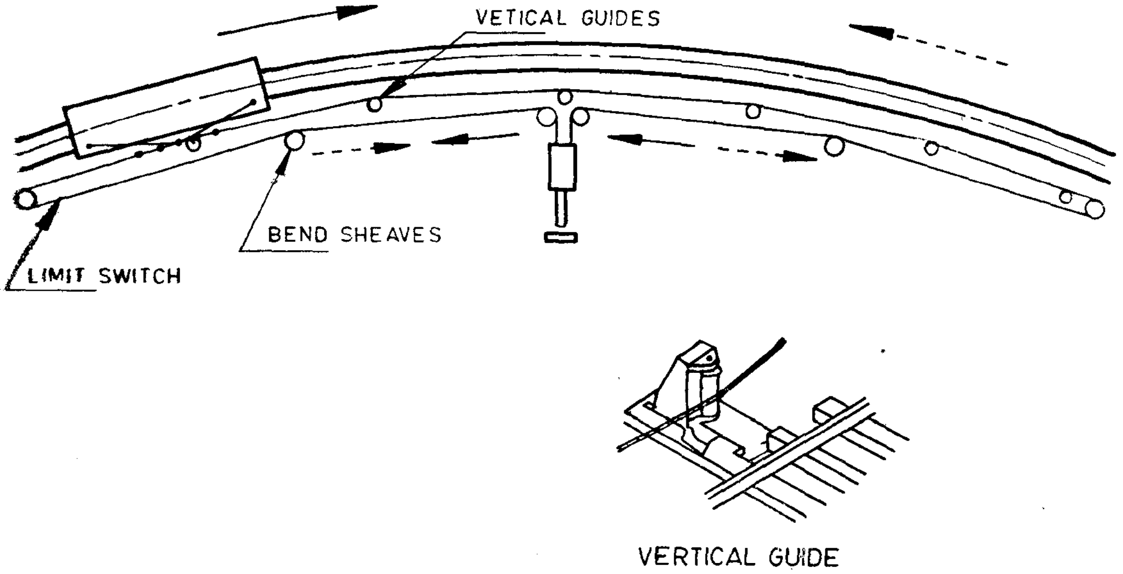
5.2.1 Rope drums shall be of heavy duty design, statically balanced, with adequate thickness after grooving.

5.2.2 These shall be of proper size, free running and properly grooved for economical wire rope service. The ratio of tread diameter of drum

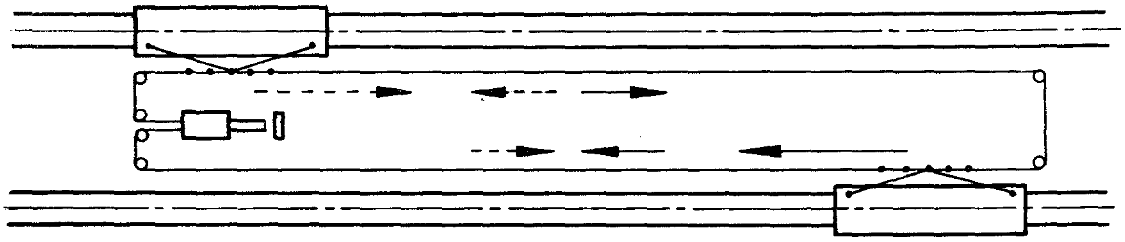


* POSITION MAY BE AT ANY POINT IN ITS TRAVEL.

A) WAGON HAULER SERVING SINGLE TRACK

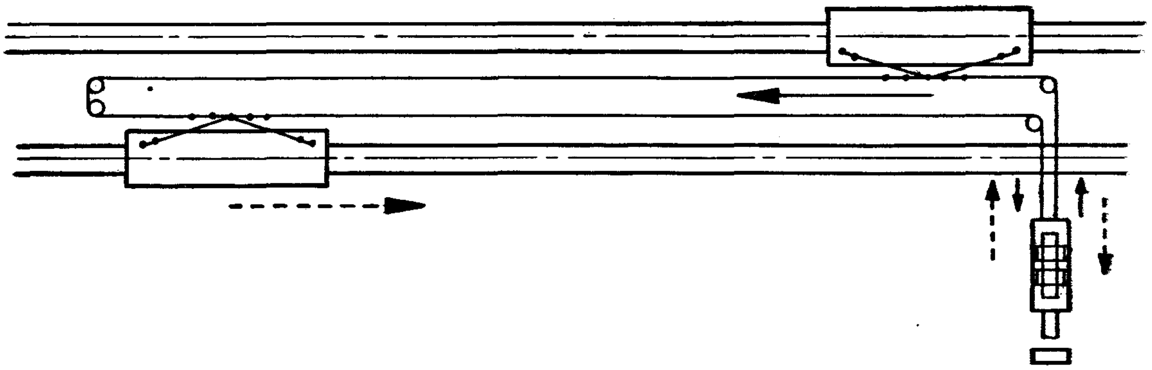


B) WAGON HAULER SERVING SINGLE CURVED TRACK

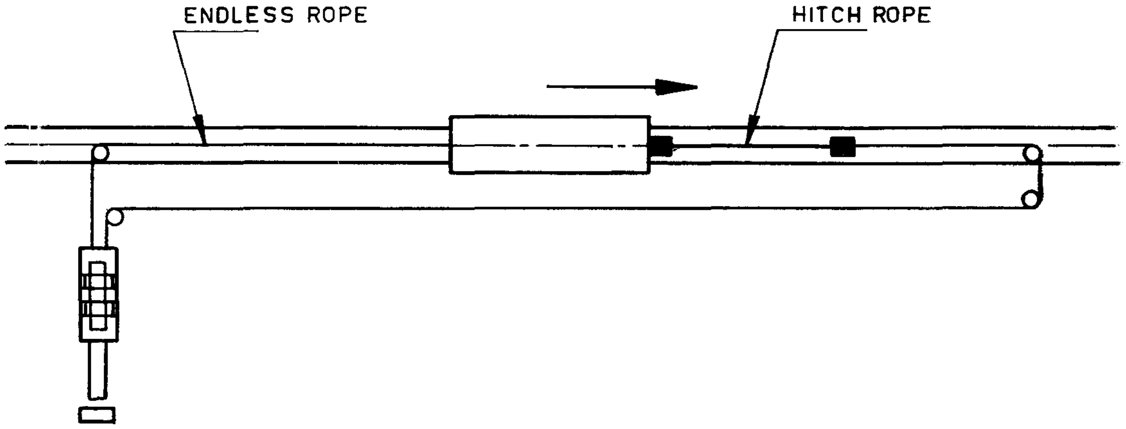


C) WAGON HAULER SERVING TWO TRACKS HAULER AND ROPE LOOP BETWEEN TWO TRACKS

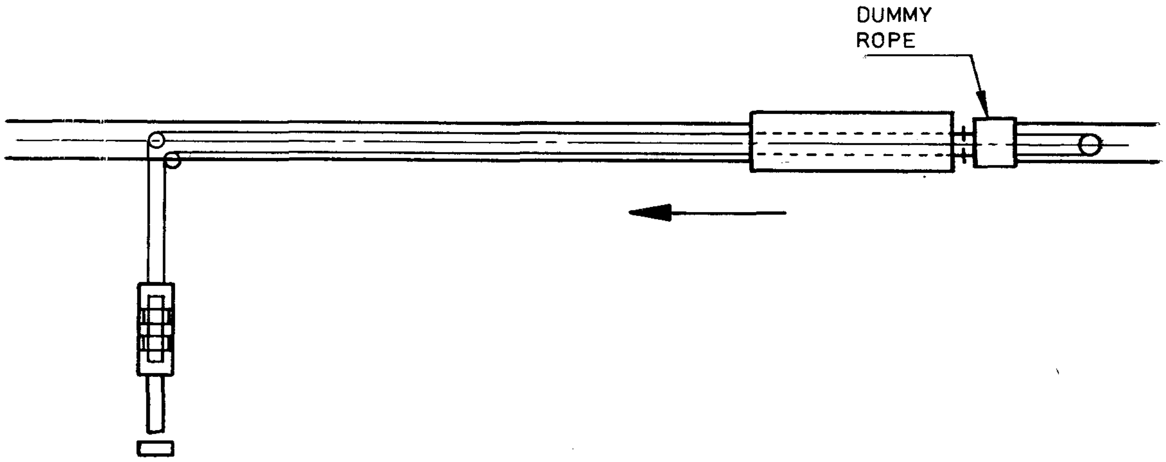
FIG, 1 ILLUSTRATION OF WAGON HAULER SERVING VARIOUS TRACKS LAYOUTS WITH DIFFERENT SHEAVE ARRANGEMENTS — *Contd*



D) WAGON HAULER SERVING TWO TRACKS HAULERS LOCATED OUTSIDE TRACKS, ROPE LOOP BETWEEN TRACKS

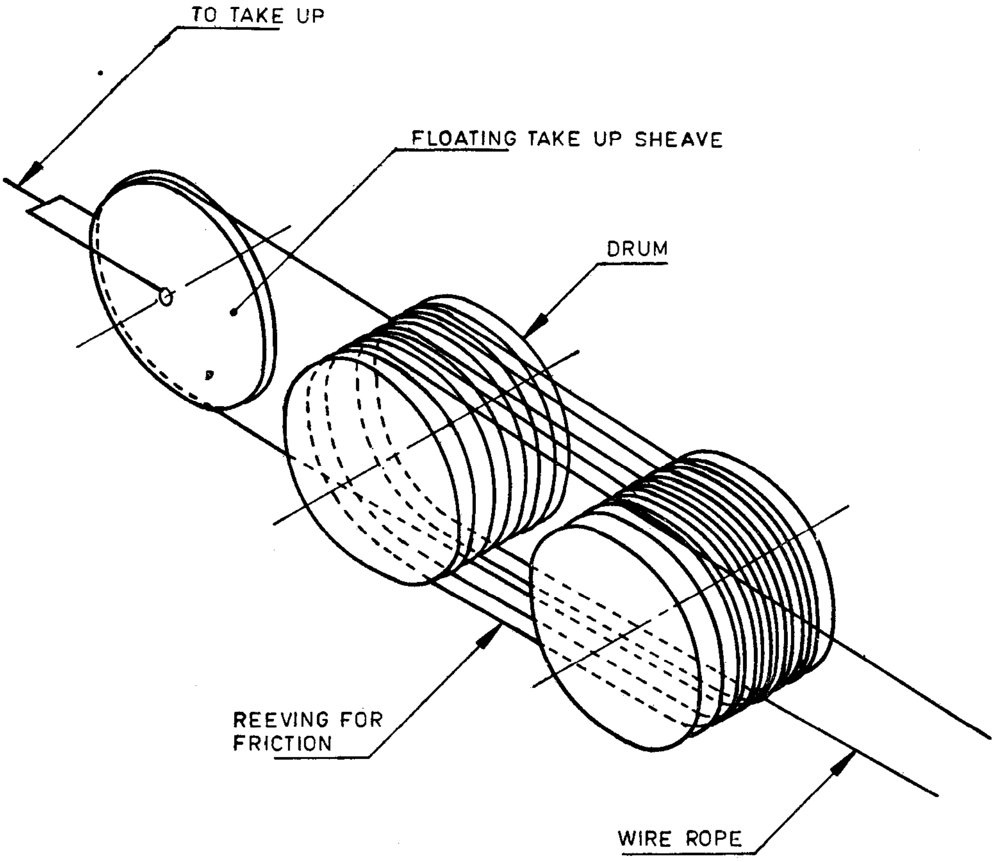


E) WAGON HAULER SERVING SINGLE TRACK WITH WAGONS ATTACHED CENTRALLY BY HITCH ROPE

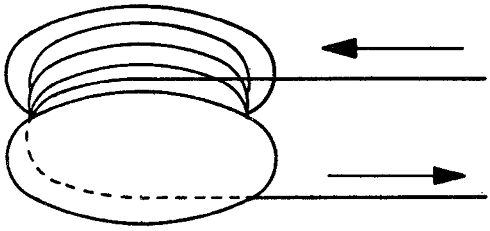


F) WAGON HAULER SERVING SINGLE TRACK WITH WAGONS PUSHED BY DUMMY WAGON

FIG. 1 ILLUSTRATION OF WAGON HAULER SERVING VARIOUS TRACK LAYOUTS WITH DIFFERENT SHEAVE ARRANGEMENTS



TWO DRUMS WITH PARALLEL MULTIPLE GROOVES



SINGLE DRUM WITH SPIRAL GROOVES

FIG. 2 ILLUSTRATION OF ARRANGEMENTS OF ROPE AND DRUM(S)

to rope diameter shall not be less than that given below:

Rope Construction	*Minimum Ratio*
Round strand 6×7	42
Round strand 6×19	24
Round strand 6×37	19

5.2.3 The groove diameter and pitch shall be in accordance with IS 3937 : 1967.

5.2.4 To avoid excessive wear and groove corrugation the radial pressure exerted by the wire rope on the drum or sheave (*see* **5.10**) calculated as under shall be less than the values given in Table 1:

$$P = \frac{20\,T}{D \times d}$$

where

P = Radial pressure in MPa

T = Rope tension in kg

D = Tread diameter of drum or sheave in mm

d = Rope diameter in mm

Table 1 Radial Pressure

(*Clause* 5.2.4)

Rope Construction	Recommended maximum Radial Pressure in MPa	
	Cast iron drum	Cast steel drum
Round strand 6×7	2·1	3·85
Round strand 6×19	3·5	6·30
Round strand 6×37	4·2	7·50

5.2.5 If agreed to between the purchaser and the manufacturer the drum shall be fitted with renewable sigment of chilled cast iron surge pad.

5.3 Brakes

Remote controlled thruster brake acting directly on the wheel or shaft shall be provided for emergency and service braking.

5.3.1 Brake 'On', 'Off' and 'Wear' providing switches shall be fitted to both the service brake and emergency brake.

5.4 Reducer Unit

5.4.1 Reduction between motor and rope drum may be achieved in two stages:

a) by a reduction gear box; and

b) by an open reduction spur pinion and wheel with protective guards.

5.4.2 Gear Box shall be completely enclosed, running in oil bath giving quitness of operation.

5.4.3 For drive motor power requirement up to 30 kW worm reduction gear box may also be considered.

5.4.4 Above 30 kW of drive motor helical gear box or spiral level and helical gear type reduction box shall be preferred.

5.4.5 The gear box shall be rated with the following minimum service factor for electric drives, in accordance with IS 7403 : 1974.

Duration of Service Hours Per Day	*Service Factor*
8	1·1
12	1·25
24	1·5

5.4.6 The gear shall be machined cut end hardened, if necessary.

5.5 Shafts

All shafts shall be of adequate section for strength and rigidity and ground to fine limits on bearing portion and gear/pinion/sheave seating portion.

5.6 Keys and Keyways

The keys and keyways shall conform to appropriate Indian Standards (*see* Annex A).

5.7 Screw Threads

The threads of screwed components shall be in accordance with IS 4218 (in various parts) (*see* Annex A).

5.8 Coupling

The flexible coupling shall be provided between motor and gear box but fluid coupling shall be used for drives above 40 kW.

5.9 Bearing

Bearing supporting drum shaft shall either be split gun metal, phosphor bronze bush or self aligning spherical roller bearings mounted in cast iron plummer blocks, and provided with grease nipples/stauffer grease cups for regreasing.

5.10 Sheaves

The sheaves shall be of adequate diameter such that the ratio of sheave diameter to rope diameter shall not be less than that given in **5.2.2**. The radial pressure shall be within maximum limit specified in **5.2.4**.

5.11 Take-up Device

Counter weighted gravity take-up which act automatically for operation in either direction with sufficient allowance for take-up movement shall be provided.

5.12 Track Rollers and Vertical Guide Rollers

5.12.1 Track rollers and vertical guides flanged at both ends may have cost or fabricated parallel barrels with sealed grease filled single row deep groove ball bearings, within the roller. They shall be designed to take into account the ardous conditions such as presence of abrasive dirt and moisture.

5.12.2 The diameter of roller shall be related to duty, that is load and speed of rope and shall be one of the following:

101·6. 115·0, 127·0, 152·4, 193·7 mm

NOTE — These diameters are the nominal outside diameters of the corresponding pipes.

5.12.3 Length of rollers over flanges corresponding to diameter shall be agreed to between the purchaser and the manufacturer from the following:

Roller Diameter (mm)	*Length Over Flanges* (mm)
101·6	230, 300
115·0	230, 300
127·0	230, 300
152·4	230, 300, 450
193·4	300, 450

5.13 Haul Rope

Haul rope shall be of adequate cross section having breaking strength not less than four times the maximum rope pull and shall conform to IS 1856 : 1977.

5.14 Motor

The electric motor shall be high starting torque type, totally enclosed duty conforming to IS 325 : 1978.

5.14.1 Number of starts per hour shall be determined and indicated to the manufacturer. Depending on requirement it may be required to operate with variable speed or with dual speed or with single speed.

5.15 Starter (Controller)

5.15.1 Controller shall be reversing type adequately rated to suit the drive. It shall be provided with means for protecting the motor against short circuits, over load, under voltage, earth leakage and single phasing. A 'No-volt' release system shall be provided.

5.15.2 All semi-magnetic and full magnetic electric controls shall be provided with fuses for protection of control circuits.

5.15.3 The remote control circuits incroporating remote start and stop shall be provided.

5.15.4 Over travel limit switches shall be used to stop the haulage in case the operator neglects to stop the haulage rope, before the master link strikes the terminal sheaves.

ANNEX A

(*Clauses* 3, 5.1, 5.6 *and* 5.7)

LIST OF INDIAN STANDARDS RELEVANT TO WAGON MARSHALLING EQUIPMENT

A-1 MATERIALS AND COMPONENTS/ PARTS

A-1.1 Ferrous Material

IS No.	*Title*
210 : 1978	Grey iron castings (*third revision*)
226 : 1975	Structural steel (standard quality) (*fifth revision*)
808	Dimensions for hot-rolled steel sections
808 (Part 1) :1978	MB series (beams) (*second revision*)
808 (Part 2) : 1978	Columns - SC series (*second revision*)
808 (Part 3) : 1979	Channel, MC and MCP series (*second revision*)
808 (Part 5) : 1976	Equal leg angles (*second revision*)
808 (Part 6) : 1976	Unequal leg angles (*second revision*)
961 : 1975	Structural steel (high tensile) (*second revision*)
1030 : 1982	Carbon steel castings for general engineering purposes (*third revision*)
1387 : 1967	General requirements for supply of metallurgical materials (*first revision*)
1570 : 1961	Schedules for wrought steels for general engineering purposes
1570 (Part 1) : 1978	Steel specified by tensile and/or yield properties (*first revision*)
1570 (Part 2) : 1979	Carbon steels (unalloyed steels) (*first revision*)
1570 (Part 3) : 1979	Carbon and carbon-manganese free cutting steels (*first revision*)
1570 (Part 5) : 1972	Stainless and heat-resisting steels (*first revision*)
1865 : 1974	Iron castings with spheroidal or modular graphite (*second revision*)
1875 : 1978	Carbon steel billets, blooms, slabs and bars for forgings (*fourth revision*)
2004 : 1978	Carbon steel forgings for general engineering purposes (*second revision*)

IS No.	*Title*
2062 : 1984	Weldable structural steel (*third revision*)
2107 : 1977	Whiteheart malleable iron castings (*first revision*)
2108 : 1977	Blackheart malleable iron castings for general engineering purposes (*second revision*)
2708 : 1984	1·5 percent manganese steel castings for general engineering purposes (*second revision*)

A-1.2 Gears

IS No.	*Title*
7403 : 1974	Code of practice for selection of standard worm and helical gear boxes

A-1.3 Keys and Keyways and Splines

IS No.	*Title*
2048 : 1983	Parallel keys and keyways (*second revision*)
2291 : 1981	Tangential keys and keyways (*second revision*)
2292 : 1974	Taper keys and keyways (*first revision*)
2293 : 1974	Gib-head keys and keyways (*first revision*)
2294 : 1980	Woodruff keys and keyways (*first revision*)
2327 : 1963	Dimensions for straight sides splines for general engineering use
3654 : 1966	Dimensions for straight sides serrations
3665 : 1966	Dimensions for involute sided splines

A-1.4 Motor

IS No.	*Title*
325 : 1978	Three phase induction motors (*fourth revision*)

A-1.5 Threaded Fasteners

IS No.	*Title*
1367	Technical supply conditions for threaded steel fasteners
1367 (Part 1) : 1980	Introduction and general information (*second revision*)
1367 (Part 2) : 1979	Product grades and tolerances (*second revision*)
1367 (Part 3) : 1979	Mechanical properties and test methods for bolts, screws and studs with full loadability (*second revision*)
1367 (Part 5) : 1980	Mechanical properties and test methods for set screws and similar threaded fasteners not under tensile stress
1367 (Part 6) : 1980	Mechanical properties and test methods for nut with specified proof loads (*second revision*)
1367 (Part 7) : 1980	Mechanical properties and test methods for nuts without specified proof loads (*second revision*)
1367 (Part 9) : 1979	Surface discontinuities on bolts, screws and studs (*second revision*)
1367 (Part 10) : 1979	Surface discontinuities on nuts (*second revision*)
1367 (Part 12) : 1981	Phosphate coatings on threaded fasteners (*second revision*)
1367 (Part 13) : 1983	Hot-dip galvanized coatings on threaded fasteners (*second revision*)
1367 (Part 14) : 1984	Stainless steel threaded fasteners (*second revision*)
1367 (Part 16) : 1979	Designation system and symbols (*first revision*)
1367 (Part 18) : 1979	Marking and mode of delivery (*second revision*)
4218	ISO metric screw threads
4218 (Part 1) : 1976	Basic and design profiles (*first revison*)
4218 (Part 2) : 1976	Diameter pitch combinations (*first revision*)
4218 (Part 3) : 1976	Basic dimensions for design profiles (*first revision*)
4218 (Part 4) : 1976	Tolerancing system (*first revision*)
4218 (Part 5) 1979	Tolerances (*first revision*)
4218 (Part 6) : 1978	Limits of sizes for commercial bolts and nuts (diameter range 1 to 52 mm) (*first revision*)

A-1.6 Wire Ropes

IS No.	*Title*
1856 : 1977	Steel wire ropes for haulage purposes in mines (*second revision*)
3973 : 1967	Code of practices for the selection, installation and maintenance of wire ropes

NOTE — This list is not exhaustive and also for updated information latest available BIS Handbook may be referred to.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publication), BIS.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference :

Doc : No. HMD 07 (5153)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	331 01 31 331 13 75
Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola CALCUTTA 700054	37 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	53 38 43
Southern : C.I.T. Campus, IV Cross Road, MADRAS 600113	235021 6
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093	6 32 92 95

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR.
COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI.
HYDERABAD. JAIPUR. KANPUR. PATNA. THIRUVANANTHAPURAM.

Printed at Swatantra Bharat Press, Delhi. India